CLAIMS

We claim:

1. A method of etching a shaped cavity in a substrate, wherein initial etching of said shaped cavity is performed using an initial process chamber pressure, and wherein continued etching of the shaped cavity is performed using a process chamber pressure that is at least 25% lower than said initial process chamber pressure, whereby etch byproducts formed during etching of said shaped cavity are removed from said shaped cavity during continued etching.

2. A method of etching a shaped cavity in a substrate, wherein the method comprises the steps of:

a) an initial cavity etch step during which said substrate is etched to form a shaped cavity using an initial process chamber pressure; and

b) at least one additional etch step during which continued etching of said shaped cavity is performed using a process chamber pressure that is at least 25% lower than said initial process chamber pressure.

3. The method of Claim 2, wherein a second etch step is performed using a process chamber pressure that is within a range of about 30% to about 50% lower than said initial process chamber pressure.

4. The method of Claim 3, wherein said second etch is performed using a process chamber pressure that is about 30% lower than said initial process chamber pressure.

5. The method of Claim 2, wherein said method further comprises an etch finishing step, wherein said etch finishing step is performed using a process chamber pressure that is

within a range of about 80% to about 100% of said initial process chamber pressure.

6. The method of Claim 3, wherein said method further comprises a third etch step during which continued etching of said shaped cavity is performed using a process chamber pressure that is at least 40% lower than the process chamber pressure used during the performance of said second etch step..

7. The method of Claim 6, wherein said third etch step is performed using a process chamber pressure that is within a range of about 40% to about 50% lower than the process chamber pressure used during the performance of step b).

8. The method of Claim 6, wherein said method further comprises an etch finishing step, wherein said etch finishing step is performed using a process chamber pressure that is within a range of about 80% to about 100% of said initial process chamber pressure.

9. The method of Claim 5 or Claim 8, wherein said etch finishing step is performed using a process chamber pressure that is about 90% of said initial process chamber pressure.

10. The method of Claim 2 or Claim 5 or Claim 6 or Claim 8, wherein said substrate comprises silicon, and etching is performed using a plasma containing reactive fluorine species.

11. The method of Claim 10, wherein said plasma is generated from a source gas comprising SF_6 and Ar.

12. The method of Claim 11, wherein said plasma source gas further comprises an additive gas selected from the group consisting of O_2, HBr, Cl_2, N_2, and combinations

thereof.

13. The method of Claim 2 or Claim 5 or Claim 6 or Claim 8, wherein etching is performed using a plasma generated from a source gas comprising a gas selected from the group consisting of SF_6, CF_4, Cl_2, HBr, and combinations thereof.

14. The method of Claim 13, wherein said plasma source gas further comprises an additive gas selected from the group consisting of Ar, O_2, HBr, Cl_2, N_2, and combinations thereof, wherein said additive gas is provided in an amount sufficient to improve profile control during etching.

15. The method of Claim 13, wherein said plasma source gas further comprises an essentially nonreactive, diluent gas selected from the group consisting of He and Xe.

16. The method of Claim 14, wherein said plasma source gas further comprises an essentially nonreactive, diluent gas selected from the group consisting of He and Xe.

17. The method of Claim 2, wherein said substrate comprises polysilicon, and etching is performed using a plasma generated from a source gas comprising a gas selected from the group consisting of SF_6, Cl_2, and combinations thereof.

18. The method of Claim 2, wherein said substrate comprises silicon dioxide, and etching is performed using a plasma generated from a source gas comprising a gas selected from the group consisting of CF_4, NF_3, and combinations thereof, and wherein etching is performed at a substrate temperature within the range of about 50°C to about 100°C.

19. The method of Claim 2, wherein said substrate comprises silicon nitride, and etching

is performed using a plasma generated from a source gas comprising SF_6.

20. The method of Claim 2, wherein said substrate comprises a metal, and etching is performed using a plasma generated from a source gas comprising Cl_2.

21. The method of Claim 20, wherein said metal is selected from the group consisting of aluminum and an aluminum alloy.

22. The method of Claim 2, wherein said substrate comprises polyimide, and etching is performed using a plasma generated from a source gas comprising O_2 and CF_4.

23. The method of Claim 2 or Claim 5 or Claim 6 or Claim 8, wherein said method includes performing the following steps prior to etching said shaped cavity: etching said substrate to a predetermined depth to form a shaped opening, then forming a conformal protective layer overlying at least the sidewall of said shaped opening, wherein said protective layer comprises a material having a different etch selectivity than said substrate, wherein said shaped cavity is etched so that said shaped cavity directly underlies and is in continuous communication with said shaped opening, and wherein said shaped cavity is etched using an etchant gas which selectively etches said substrate relative to said protective layer, whereby said protective layer effectively preserves the profile of said shaped opening during etching of said shaped cavity.

24. The method of Claim 23, wherein said substrate comprises silicon and said protective layer comprises silicon oxide.

25. An apparatus, comprising:

(a) a memory that stores instructions for:

etching a shaped cavity in a substrate, said method comprising the steps of:

i) an initial cavity etch during which said substrate is etched to form a shaped cavity using an initial process chamber pressure; and;

ii) at least one additional etch step during which continued etching of said shaped cavity is performed using a process chamber pressure that is at least 25% lower than said initial process chamber pressure;

(b) a processor adapted to communicate with the memory and to execute the instructions stored by the memory;

(c) an etch chamber adapted to carry out said etching in accordance with the instructions from said memory; and

(d) a port adapted to pass communications between said processor and said etch chamber.

26

28. An article of manufacture comprising:

a recordable medium having recorded thereon a plurality of programming instructions used to program an apparatus which controls the etching of a shaped cavity in a substrate to proceed by the method of Claim 1 or Claim 2.

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